Remarks

The present response is to the Office Action mailed the above-referenced case on January 09, 2006. Claims 1-39 are standing for examination. Claims 1-39 are rejected under 35 U.S.C. 102 (b) as being anticipated by Dobbins et al. (U.S. 5,751,971), hereinafter Dobbins.

Applicant has carefully studied the reference provided by the Examiner, and the Examiner's rejections and statements of the instant Office Action. In response to the Examiner's rejection of applicant's claims, applicant provides argument to more particularly point out and clarify to the Examiner the subject matter of applicant's invention regarded as patentable, which the applicant believes is not taught by Dobbins

Regarding claims 1 and 13, the Examiner has stated that Dobbins anticipates all of the limitations of applicant's claims. Applicant respectfully disagrees with the Examiner's assertion. Applicant argues that Dobbins does not teach a true hierarchical bond structure, as is claimed.

Referring the Examiner now to applicant's specification with reference to Fig. 7, a network routing table (NRT) 700 is shown having a primary bond 701 and a physical bond 702. Primary bond 701 can be any number of physical interfaces which may be defined by software. Physical bond 702 is simply a physical interface. In prior art, if the primary bond 701 of NRT 700 connects to each of the physical interfaces of the forwarding plane (layer 2), that primary bond might consist of the six physical interfaces (P), and physical bond 702 is the seventh physical interface.

Applicant's invention defines sub-interfaces (bonds) below primary bond 701 so that the primary bond might consist of a sub-bond 703 and two physical interfaces, and sub-bond 703 would consist of three physical interfaces. As shown in the figure, there are a total of five physical interfaces in layer 2 (control plane), but they are addressed in layer 3 as three virtual interfaces. Two physical interfaces may be addressed as a virtual interface, and the forwarding in layer 3 does not know whether it is sending data to a virtual or physical interface. It does not need to know because it has an address and sends data to that address. The address may be the address of a bond a virtual interface) rather than a physical interface, or it could be a physical interface.

Layer 3 protocols see both physical and virtual interfaces as single interfaces, or trunks. The different virtual and physical interfaces each have a pre-fixes address in layer 3. As taken from the specification with reference to Fig. 7, primary bond 701 (represented as a logical interface in Layer 3) is illustrated in Layer 2 (control plane) as a plurality of primary bond members (Primary B-Members) enclosed in a dotted rectangle. There are 3 illustrated bond members comprising bond 701, one of these labeled a subjugate bond (S-bond) 703. S-bond 703 is illustrated broken-down below bond 701 as an aggregate of 3 physical links labeled S- B-Members (B denoting bond). S-bond 703 is a logical bond member of primary bond 701. In terms of bandwidth capacity, the primary bond member 703 comprises the sum of the bandwidth capacities of the physical links comprising S- bond 703. Likewise, primary bond 701 contains the sum of the bandwidth of 3 primary bond members (ports) 701 plus the sum of the bandwidth of the 3 S-bond members (703).

Logical interface 702 represents a real physical link defined in layer 2 wherein there are no aggregated links associated. Although link-state routing protocols such as OSPF or ISIS in layer 3 cannot distinguish that interface 701 is an aggregate of layer 2 data links (2 bond levels), they are aware of the bandwidth capacity of interface 701 and 702. Network administrators can use this aspect for such as load-balancing purposes and in dynamically rearranging and manipulating bond structures through control line interfacing for further optimization of network resources, which essentially is bandwidth.

Referring again to Fig. 7, sub-bond 703 has three physical ports, and primary bond 701 has one sub-bond 703 and two physical ports. Applicant's invention allows changing of the grouping according to the addressing and controls load balancing and so forth according to the bandwidth associated with each port. Layer 3 protocols no the bandwidth of the ports, but doesn't know that of the physical ports involved.

Now referring to applicant's Fig. 8, primary bond 801 has six connections to line card (LC) three, each of which is a separate connection. Sub-bond 802, which can be addressed with a single address, has six connections to LC 2, and two connections to LC1. LC1 has four outside ingress/egress ports which are each stand-alone addressable ports. Each line card has two communication interfaces to ports of the internal fabric.

The key and patentable aspect of applicant's invention is that an addressable virtual grouping (S-bond 802) is provided within another addressable virtual interface (P-bond 801). S-bond 802 and P-bond 801 are both addressable in layer 3. However, each of the individual ports cannot be, and do not need to be addressed in layer 3. Referring again to applicant's Fig. 8, in layer 3 the four physical links to LC1 can be addressed, as well as P-bond 801 and S-bond 802. Bonds 801 and 802 are virtual interfaces having components of one another at separate routing levels. Virtual S-bond 802 is actually nested within virtual P-bond 801. Applicant's invention provides for having a virtual interface, or bond, composed of another virtual interface, which could itself have a virtual interface and a physical interface, or just a physical interface. One bond can be composed of other bonds which could be composed of other virtual bonds or physical bonds in any combination.

The idea of bonds as discussed in applicant's background section is well-known in the art. However, applicant argues that having bonds within bonds was not known at the time of the invention. Applicant's invention teaches true hierarchical bonding structure, which is clearly not taught in the invention of Dobbins.

Now referring the Examiner to Dobbins with reference to Fig. 2, router 11 has an interface 12A and 12B connected to physical interfaces 13A and 13B. It is not clear in the teachings of Dobbins whether interfaces 12A and 12B are virtual or physical interfaces, as the teaching is vague and inconclusive to this aspect, however, applicant believes they are physical interfaces since Dobbins teaches connecting them to physical interfaces 13A and 13B.

Applicant argues that Dobbins does not teach a true hierarchical bonding structure, and that it is not obvious in Fig. 2 or the description for Fig. 2, that it teaches a hierarchical structure of virtual interfaces or bonds, as in applicant's invention. Further, the specification of Dobbins does not describe that hosts 14 of Fig. 2 are virtual interfaces which are themselves composed of physical or virtual interfaces. The fact that interfaces 12A and 12B are assigned the same IP address may suggest that they are software-related as a virtual interface; there is no showing or description of sub-virtual interfaces.

Applicant's invention teaches that there may be sub-virtual interfaces nested within other virtual interfaces. This teaching is simply not provided by Dobbins. The invention of Dobbins has the object of increasing host mobility within the network, conserving on assignment of network addresses, simplifying the configuration of subnets, and providing enhanced network security. However, the invention does not address enhancing and simplifying load balancing, because there is no way for Dobbins to load balancing because to do so, bandwidth conditions of all the ports must be monitored and the network administrator must have the ability to change the hierarchical structure, i.e. bonds within bonds, as required for enabling more efficient load balancing.

Applicant therefore firmly believes that independent claims 1, 7, 13 and 25, all of which recite hierarchical bonding structure, are clearly and unarguably patentable over the reference of Dobbins as argued above by applicant. Depending claims 2-6, 8-12, 14-24 and 26-39 are then patentable on their own merits, or at least as depended from a patentable claim.

As all of the claims standing for examination have been shown to be patentable as argued over the art of record, applicant respectfully requests reconsideration, and that the present case be passed quickly to issue. If there are any time extensions needed beyond any extension specifically requested with this response, such extension of time is hereby requested. If there are any fees due beyond any fees paid with this amendment, authorization is given to deduct such fees from deposit account 50-0534.

Respectfully Submitted,
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